

What is claimed is:

1. A precleaner arrangement for separating a portion of entrained material from air flow air entering an engine air cleaner; the precleaner arrangement comprising:
  - 5 (a) a vane structure arrangement including at least a first, adjustable, air deflection vane;
    - (i) the first, adjustable, air deflection vane having a flexible portion deflectable between a first orientation and a second orientation;
    - (ii) the flexible portion having a memory bias toward the first orientation; and,
    - (iii) the flexible portion being configured to deflect toward the second orientation, in response to a sufficient air flow rate increase through the precleaner arrangement, in use.
- 10 2. A precleaner arrangement according to claim 1 wherein:
  - (a) the vane structure arrangement comprises a plurality of adjustable air deflection vanes positioned around a central hub;
    - 20 (i) each adjustable air deflection vane having a flexible portion deflectable between a first orientation and a second orientation;
    - (ii) each flexible portion having a memory bias toward a first orientation; and,
    - (iii) each flexible portion being configured to deflect toward the second orientation in response to a sufficient air flow rate increase through the precleaner arrangement, in use.
- 25 3. A precleaner arrangement according to claim 2 wherein:
  - (a) each adjustable air deflection vane comprises:
    - (i) a flexible member; and,
    - (ii) a rigid structural member.

4. A precleaner arrangement according to claim 3 wherein:

(a) the vane structure arrangement includes at least three adjustable air deflection vanes.

5 5. A precleaner arrangement according to claim 4 wherein:

(a) the vane structure has a first axial total vane length X and a first vane perimeter size Y;

(b) the precleaner being configured such  $X < Y$ .

10 6. A precleaner arrangement according to claim 5 wherein:

$X < 0.7Y$

7. A precleaner arrangement according to claim 6 wherein:

$X < 0.3Y$

15 8. A precleaner arrangement according to claim 4 wherein:

(a) the vane structure includes a perimeter rim:

(i) each adjustable air deflection vane being secured in extension between the central hub and the perimeter rim; and

20 (ii) a perimeter edge portion of each flexible portion being spaced from the perimeter rim, to define a flexible, downstream, outer ear in the associated flexible portion.

9. A precleaner arrangement according to claim 8 wherein:

25 (a) each adjustable air deflection vane has: a lead, upstream, edge; and, a tail, downstream, edge; and

(b) the flexible member has a concave upstream surface in extension between the lead edge and the tail edge, when in the first orientation.

10. A precleaner arrangement according to claim 9 having:

(a) a projection angle A between the lead upstream edge of each adjustable air deflection vane and a tail edge of a next adjacent air deflection vane of at least 17°.

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11. A precleaner arrangement according to claim 8 wherein:

(a) the vane structure arrangement is secured to a perimeter housing structure having a dust drop tube.

10 12. An air cleaner comprising:

(a) a precleaner arrangement comprising a vane structure arrangement including a plurality of adjustable, air deflection vanes;

(i) each adjustable air deflection vane having:

(A) a flexible member; and,

15 (b) a rigid structural member;

(ii) each flexible member being deflectable between a first orientation and a second orientation;

(iii) each flexible member having a memory bias toward the first orientation; and

20 (iv) the flexible member being configured to deflect toward the second orientation, in response to a sufficient air flow rate increase through the precleaner arrangement, in use; and

(b) a main air cleaner positioned to receive air from the precleaner arrangement;

25 (i) the main air cleaner having a serviceable air filter element therein.

13. An air cleaner arrangement according to claim 12 wherein:

(a) the serviceable air filter element comprises z-filter media.

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14. A method of operating a precleaner to separate a portion of entrained

material from air flow entering an engine air cleaner; the method including steps of:

- (a) directing air through air deflection vanes of a vane structure of the precleaner at a first flow rate; and
- 5 (b) increasing air flow from the first flow rate to a second, higher, flow rate while adjusting configuration of selected vanes in the vane structure by deforming flexible portions of the vanes toward a downstream direction in response to the second, higher, flow rate.

10 15. A method of manufacturing a vane structure arrangement of a precleaner; the method including steps of:

- (a) injecting a first material into a mold arrangement, to form a support structure; and,
- (b) injecting a second moldable material, into contact with the first material, to form flexible vane portions configured to deflect toward a downstream direction in response to a sufficient air flow rate increase through the vane structure arrangement of the precleaner.

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